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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/964,859	09/28/2001	Kenichi Nishikawa	040894-5728	2375

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EXAMINER
KRISHNAN, SUMATI

ART UNIT	PAPER NUMBER
2875	

DATE MAILED: 06/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/964,859	Applicant(s) NISHIKAWA ET AL.	
	Examiner Sumati Krishnan	Art Unit 2875	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11* is/are allowed.

6)☒ Claim(s) *2,3 and 6-10* is/are rejected.

7)☒ Claim(s) *4 and 5* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Examiner Notes

The Examiner regrets to inform that the indicated allowability of claim 3 is withdrawn in view of the newly discovered reference(s) to Nishikawa (US 5859491) column 7 lines 20-25. The rejection to claim 3 follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 3, 8 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishikawa (US 5859491).

Regarding claims 3 and 10, Nishikawa discloses a spark plug comprising a center electrode (element 4), a metal shell (element 1), and an insulator (element 2) comprising alumina ceramic and disposed between the center electrode and the metal shell (see col. 3 lines 8-13). Nishikawa discloses the insulator covered with a glaze containing a PbO content of 10 wt. % or less which includes the claimed 1 mol % or less. The limitation existing in the claims that the glaze layer has a Vickers hardness of Hv 100 or more is not given any patentable weight because it is considered to be a property of the composition of the glaze layer. Nishikawa discloses that the glaze layer contains at least one of phosphates, sulfates and fluorides and chlorides.

Specifically, Nishikawa discloses that a fluoride ion be included in the glaze layer, see column 7 lines 20-25.

Regarding claim 8, the limitations of chroma and lightness are not given any patentable weight because they are considered to be inherent properties of the structure claimed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishikawa (US 5859491) in view of Knapp (US 5677250). Nishikawa discloses the spark plug as claimed in claim 1, but does not disclose the components of the glaze layer in the same percentages as applicant claims. Knapp, however discloses ranges for the components of the glaze layer that fall into the ranges that the applicant claims. Knapp discloses the percentages in terms of % weight, while applicant discloses the percentages in terms of mol %. In order to make the comparison, the weight percentages of Knapp were converted to mol %. To facilitate this, the examiner has determined the molecular weight of applicant's glaze layer as a whole using a mol % that falls in the middle of the mol% range claimed for each compound in the layer, (for example, 28% for SiO_2). Multiplying the average mol % of each compound by the respective molecular weight of each compound gives the grams/mol total of each compound in applicants glaze. Adding up the grams/mol total of all of the compounds in the glaze gives the total

molecular weight of applicants compound. This sum was found to be 82.6 grams/mol total. Multiplying the weight percentage of each compound disclosed by Knapp (for example 27% of SiO2) by the total molecular weight of applicant (82.6), and dividing that product by the molecular weight of the compound of concern (for example 60 for SiO2) gives the mol %. In doing this analysis for each of the compounds claimed by applicant, it was found that all of the compounds claimed by applicant fell into the ranges claimed by Knapp.

Knapp discloses a glaze layer that can be fired at low temperatures which has the many advantages of reducing energy consumption and reducing wear on equipment. In addition, Knapp discloses that the ceramic materials used in the spark plug core assemblies experience a reduced tolerance to the high temperature conventionally employed in firing a glaze. The composition disclosed by Knapp enables the glaze to be fired at such low temperatures as 121-204 degrees C. See column 3. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the composition of the glaze layer as disclosed by Knapp in order to employ lower firing temperatures and therefore improve the lifetime of the ceramic materials and other equipment, as well as reduce energy consumption.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishikawa (US 5859491) in view of Suzuki (US 6492289). Nishikawa discloses the spark plug as claimed in claim 1, but does not disclose the glaze layer containing the compounds as claimed in cliam 6. Suzuki, however, discloses a glaze layer including the compounds. According to Suzuki, ZrO_2 in the glaze layer stabilizes the glass in the glaze and has the effect of lowering the coeffieicent of linear expansion. Consequently, the strength of the ceramic material can be increased by coating a ceramic material with a glaze containing ZrO_2. In addition, Suzuki discloses that TiO_2

in the glaze layer in small quantities has the effect of preventing discoloration of the ceramic material by increasing weather resistance. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included these compounds in the glaze layer of Nishikawa.

Claim 7 is rejected under 35 U.S.C 103(a) as being unpatentable over Nishikawa (US 5859491) in view of Sugimoto (US 6407487). Nishikawa discloses the spark plug of claim 1, but does not disclose the glaze layer to include the elements or compounds claimed in claim 7. Sugimoto, however, discloses that the addition of Sc, V, Mn, Fe, Co, and An can be included in the insulator. These, especially Mn, have the effect of improving withstand voltage performance characteristics. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have at least included Mn on the insulator, therefore on the glaze layer, because of its effect of improving withstand voltage characteristics.

Claim 9 is rejected under 35 U.S.C 103(a) as being unpatentable over Nishikawa in view of Tsuzuki (US 5922444). Nishikawa discloses the spark plug as claimed in claim 1, wherein the insulator is formed with a projection part in an outer circumferential direction at an axially central position thereof, see element 21, taking as a front side a side directing toward the front end of the center electrode in the axial direction, a cylindrical face is shaped in the outer circumferential face at the base portion of the insulator main body in the neighborhood of a rear side opposite the projection part, and the outer circumferential face at the base portion is covered with the glaze layer. Nishikawa, does not disclose the thickness of the glaze layer. However, Tsuzuki discloses a glaze composition for use in coating a ceramic substrate such as in a spark plug, wherein the film thickness is from 5-25 microns. Tsuzuki discloses that if the glaze

composition is made thin and the glazing viscosity is high, the composition is influenced by the irregular surface of the ceramic substrate. Therefore, the glaze composition provides insufficient surface smoothness. Such deterious change of the glaze face is undesirable. A glaze composition which can provide a very thin and flat but high quality glaze face is demanded. Therefore, Tsuzuki discloses that the range between 5-25 microns is optimal for coating a ceramic substrate. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the above glaze thickness in the spark plug of Nishikawa due to the fact that it is disclosed to be an optimal range for achieving good coverage while not coating on the glaze too thick thereby making for more interference.

Allowable Subject Matter

Claims 4 and 5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record neither shows nor suggests:

the glaze layer according to claim 3 containing at least one of phosphate ion, sulfate ion, fluoride ion and chloride ion in a content of 0.5 to 10 mol %, or

Claim 11 is allowed. The following is a statement of reasons for the indication of allowable subject matter: the prior art of record neither shows nor suggests:

the glaze layer according to claim 11 formed by adding at least one of K_3PO_4 powder, $BaSO_4$ powder, CaF powder and KCI powder.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sumati Krishnan whose telephone number is 703-305-7906. The examiner can normally be reached on 8:00 am - 4:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on 703-305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

SK
June 17, 2003

Sandra O'Shea
Supervisory Patent Examiner
Technology Center 2800